

MSc Quantum Fields and Fundamental Forces

This document provides a definitive record of the main features of the programme and the learning outcomes that a typical student may reasonably be expected to achieve and demonstrate if s/he takes full advantage of the learning opportunities provided. This programme specification is intended as a reference point for prospective students, current students, external examiners and academic and support staff involved in delivering the programme and enabling student development and achievement.

Programme Information

Programme Title	Quantum Fields and Fundamental Forces			
Award(s)	MSc			
Programme Code	F3UG (1YFT)	F3UG24 (2YPT)		
Associateship	None			
Awarding Institution	Imperial College London			
Teaching Institution	Imperial College London			
Faculty	Faculty of Natural Sciences			
Department	Department of Physics			
Mode and Period of Study	1 academic year, full-time or 2 academic years, part-time			
Cohort Entry Points	Annually in October			
Relevant QAA Benchmark Statement(s) and/or other external reference points	Master's Awards in Physics, Astronomy and Astrophysics			
Total Credits	ECTS:	90 - 94	CATS:	180 – 188
FHEQ Level	Level 7			
EHEA Level	2 nd cycle			
External Accrator(s)	None			
Specification Details				
Student cohorts covered by specification	2016-17 entry			
Person responsible for the specification	Prof Kellogg Stelle			
Date of introduction of programme				
Date of programme specification/revision	March 2017			

Description of Programme Contents

The [Theoretical Physics Group](#) is internationally recognised for its contribution to our understanding of the unification of fundamental forces, the early universe, quantum gravity, supersymmetry, string theory, and quantum field theory.

This renowned MSc course is designed to prepare students for PhD study in fundamental theoretical physics by bridging the gap between an undergraduate course in physics or mathematics and the research frontier.

The origins of the programme date back to the founding of the Theoretical Physics Group by Abdus Salam, one of Imperial's Nobel Laureates.

Learning Outcomes

The Imperial Graduate Attributes are a set of core competencies which we expect students to achieve through completion of any Imperial College degree programme. The Graduate Attributes are available at: www.imperial.ac.uk/students/academic-support/graduate-attributes

Knowledge and Understanding of:

- The most fundamental laws and principles of theoretical physics; along with their application (some at the forefront of the discipline)
- Research techniques which might include research and summation of the literature, designing appropriate mathematical models and computations to test physical principles and presenting their results making their assumptions and approximations explicit;
- How to use mathematical tools to describe the physical world.

Intellectual Skills:

- Apply theoretical knowledge of physical principles and mathematical techniques to problems in the field;
- Use mathematical techniques and interpret mathematical models of physical behaviour;
- Demonstrate the ability to plan, undertake, and report on a programme of original work;
- Research and examine critically the scientific literature.

Professional Skills Development:

- Problem-solving skills;
- Investigative skills;
- Communication skills;
- Analytical skills;
- IT skills;

Personal Skills:

- Research and computational skills are taught by the project work, which requires students to design and undertake a theoretical analysis and prepare assessed technical reports and presentations.

Entry Requirements	
Academic Requirement	A first class (1st) Honours degree in physics or mathematics with theoretical physics options.
Non-academic Requirements	None
English Language Requirement	Standard requirement
The programme's competency standards document can be found at: http://www.imperial.ac.uk/physics/students/current-students/taught-postgraduates/	
Learning & Teaching Strategy	
Scheduled Learning & Teaching Methods	<ul style="list-style-type: none"> • Lectures • Problem classes
E-learning & Blended Learning Methods	<ul style="list-style-type: none"> • Blackboard VLE
Project and Placement Learning Methods	<ul style="list-style-type: none"> • Independent research project
Assessment Strategy	
Assessment Methods	<ul style="list-style-type: none"> • Written examinations • Reports
Academic Feedback Policy	
<p>The feedback policy will follow the guidelines of the Department of Physics, where written feedback should be provided to the student within two weeks of the work being submitted.</p> <p>Many of the lecture modules have classworks, which allow students to work through problems under the guidance of the lecturer.</p>	
Re-sit Policy	
The College's Policy on Re-sits is available at: www.imperial.ac.uk/registry/exams/resit	
Mitigating Circumstances Policy	
The College's Policy on Mitigating Circumstances is available at: www.imperial.ac.uk/registry/exams	

Programme Structure					
Full-time		Term One	Term Two	Term Three	
Core Modules		3	1	0	
Elective Modules		4		0	
Projects		0	0	1	
Part-time (Year One)		Term One	Term Two	Term Three	
Core Modules		2		0	
Elective Modules		1 - 2		0	
Projects		0	0	0	
Part-time (Year Two)		Term One	Term Two	Term Three	
Core Modules		2		0	
Elective Modules		2 - 3		0	
Projects		0	0	1	
Assessment Dates & Deadlines					
Written Examinations	April - May. There is a voluntary test on several of the compulsory modules in January.				
Coursework Assessments	Continuous				
Project Deadlines	September				
Practical Assessments	None				

Assessment Structure

Marking Scheme

The Pass Mark for Master's level programmes is 50%.

Pass

- In order to be awarded a result of pass, a candidate must achieve at least 50 per cent in each element;

Merit

- In order to be awarded a result of merit, a candidate must achieve at least 60 per cent in each element;
- Where appropriate, a Board of Examiners may award a result of merit where a candidate has achieved an aggregate mark of 60% or greater across the programme as a whole AND has obtained a mark of 60% or greater in each element with the exception of one element AND has obtained a mark of 50% or greater in this latter element.

Distinction

- In order to be awarded a result of distinction, a candidate must achieve at least 70 per cent in each element.
- Where appropriate, a Board of Examiners may award a result of distinction where a candidate has achieved an aggregate mark of 70% or greater across the programme as a whole AND has obtained a mark of 70% or greater in each element with the exception of one element AND has obtained a mark of 60% or greater in this latter element.

Module Weightings

Element (% Weighting)	Module	% Module Weighting
Compulsory Modules (40%)	Particle Symmetries	25%
	Quantum Electrodynamics	25%
	Quantum Field Theory*	25%
	Unification*	25%
Optional Modules (40%)	4 x elective modules	25% each
Project (20%)	Research Project	100%

* Students may replace these modules if they have already taken these modules

Indicative Module List											
Code	Title	Core/ Elective	L&T Hours	Ind. Study Hours	Place- ment Hours	Total Hours	% Written Exam	% Course- work	% Practical	FHEQ Level	ECTS
PT4.6	Unification	Core	57	143	0	200	100%	0%	0%	7	8
PT4.4	Quantum Field Theory	Core	57	143	0	200	100%	0%	0%	7	8
PH9.FQED	Quantum Electrodynamics	Core	30	170	0	200	100%	0%	0%	7	8
PH9.FPS	Particle Symmetries	Core	30	170	0	200	100%	0%	0%	7	8
PH9.FAQFT	Advanced Quantum Field Theory	Elective	30	170	0	200	100%	0%	0%	7	8
PH9.FAGR	Black Holes	Elective	30	170	0	200	100%	0%	0%	7	8
PH9.FCPP	Cosmology and Particle Physics	Elective	30	170	0	200	100%	0%	0%	7	8
PH9.FDG	Differential Geometry	Elective	30	170	0	200	100%	0%	0%	7	8
PH9.FSMB	Standard Model and Beyond	Elective	30	170	0	200	100%	0%	0%	7	8
PH9.FST	String Theory	Elective	30	170	0	200	100%	0%	0%	7	8
PH9.FSS	Supersymmetry	Elective	30	170	0	200	100%	0%	0%	7	8
PT3.1	Foundations of Quantum Mechanics	Elective	57	93	0	150	100%	0%	0%	6	6
PT3.2	Group Theory	Elective	57	93	0	150	100%	0%	0%	6	6
PT4.2	General Relativity	Elective	57	93	0	150	100%	0%	0%	7	6

Indicative Module List											
Code	Title	Core/ Elective	L&T Hours	Ind. Study Hours	Place- ment Hours	Total Hours	% Written Exam	% Course- work	% Practical	FHEQ Level	ECTS
PT4.8	Quantum Information	Elective	57	93	0	150	100%	0%	0%	7	6
PT4.5	Quantum Theory of Matter	Elective	57	93	0	150	100%	0%	0%	7	6
	Independent Research Project	Core	0	750	0	750	0%	100%	0%	7	30

Supporting Information

The Programme Handbook is available at: <http://www.imperial.ac.uk/natural-sciences/departments/physics/students/current-students/taught-postgraduates/>

The Module Handbook is available at: <http://www.imperial.ac.uk/natural-sciences/departments/physics/students/current-students/taught-postgraduates/>

The College's entry requirements for postgraduate programmes can be found at: www.imperial.ac.uk/study/pg/apply/requirements

The College's Quality & Enhancement Framework is available at: www.imperial.ac.uk/registry/proceduresandregulations/qualityassurance

The College's Academic and Examination Regulations can be found at: <http://www3.imperial.ac.uk/registry/proceduresandregulations/regulations>

Imperial College is an independent corporation whose legal status derives from a Royal Charter granted under Letters Patent in 1907. In 2007 a Supplemental Charter and Statutes was granted by HM Queen Elizabeth II. This Supplemental Charter, which came into force on the date of the College's Centenary, 8th July 2007, established the College as a University with the name and style of "The Imperial College of Science, Technology and Medicine".
<http://www.imperial.ac.uk/admin-services/secretariat/college-governance/charters-statutes-ordinances-and-regulations/>

Imperial College London is regulated by the Higher Education Funding Council for England (HEFCE) <http://www.hefce.ac.uk/reg/of/>